UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/622,848	07/18/2003	Norman L. Oberski	A126.113.102	4765

25281 7590 05/11/2006

DICKE, BILLIG & CZAJA, P.L.L.C.
FIFTH STREET TOWERS
100 SOUTH FIFTH STREET, SUITE 2250
MINNEAPOLIS, MN 55402

EXAMINER	
MONBLEAU, DAVIENNE N	
ART UNIT	**PAPER NUMBER**
2878	

DATE MAILED: 05/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/622,848	OBERSKI ET AL.	
	Examiner	Art Unit	
	Davienne Monbleau	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The amendment filed on 2/21/06 has been entered. Claims 1, 11, and 18 have been amended. Claims 1-21 are pending.

The newly submitted abstract of the disclosure is accepted.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4, 5, 8, and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by McCord et al. (U.S. 6,597,006).

Regarding claim 1, *McCord* discloses (Figure 2a) an inspection system comprising a primary optical inspection device (column 1, lines 60-63; column 7 lines 38-42) including a focusing mechanism (column 13, lines 54-59) for focusing the primary optical inspection device over a predetermined optical field of view ("sample location") to optically inspect a sample (12), and an auxiliary sensor (22a, 22B) apart from the focusing mechanism, the auxiliary sensor for mapping a sample height by obtaining height data for at least one point on the sample (12), wherein the at least one point is offset from the field of view of the primary optical inspection device (column 3, lines 52-57).

Regarding claim 2, *McCord* discloses (column 13, lines 54-59) that the height data is used to position the inspection device in focus during an inspection of the sample (12).

Regarding claim 4, *McCord* discloses (column 13, lines 54-59) that mapping the sample height is performed as a separate operation before the inspection of the sample (12) by the inspection device occurs.

Regarding claim 5, *McCord* discloses (column 4, lines 34-38) that the process of mapping the sample height is performed concurrent ("during") with inspection of the sample by the inspection device.

Regarding claim 8, *McCord* discloses (Figure 2a) that the height data comprises a pattern comprising a constant point.

Regarding claim 18, *McCord* discloses (Figure 2a) a method for inspecting a wafer (12) comprising providing an inspection sensor (column 1, lines 60-63; column 7, lines 38-42) for inspecting a surface of the waver in an optical field of view ("sample location") of the inspection sensor, providing an auxiliary sensor (22a, 22b) apart from the inspection sensor for obtaining height data of a surface of the wafer (12), obtaining a patter of height data of the surface of the wafer using the auxiliary sensor (22a, 22b), wherein the pattern of height data is obtained outside the optical field of view of the inspection sensor (column 3, lines 52-57), and inspecting the surface of the wafer (12) by focusing the inspection sensor using the height data. (See also column 13, lines 54-59.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 6, 10-12, 14-17, 19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCord.

Regarding claim 6, *McCord* teaches (Figure 2a) mapping the height of the sample, but does not explicitly teach measuring the difference in height of features on the sample. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to measure the difference in height of features on the sample to efficiently adjust the focusing mechanism of the inspection device relative do the different sample locations.

Regarding claims 10 and 21, *McCord* teaches (Figure 2a) an auxiliary sensor (22a, 22b) to measure a height of the sample, but does not teach that it is a 3D point sensor. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a 3D

point sensor in *McCord* to measure all of the dimensions and profiles of the sample with a single sensor, thus obtaining a 3D image of the sample and improving inspection of the sample.

Regarding Claim 11, *McCord* teaches (Figure 2a) an inspection system comprising a inspection sensor (column 1, lines 60-63; column 7, lines 38-42) for inspecting a wafer (12) surface and a sensor (22a, 22b) apart from the inspection sensor for generating height data for a plurality of points on the wafer surface (column 1, lines 20-26), and a wafer mapping module for using the height data to generate a height map of the wafer surface prior to an inspection of the wafer surface (column 4, lines 40-46), wherein the height map is used for setting the focus of the inspection sensor during the inspection (column 4, lines 35-46). *McCord* does not specifically teach that the height-mapping sensor is a 3D point sensor. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a 3D point sensor in *McCord* to measure all of the dimensions and profiles of the sample with a single sensor, thus obtaining a 3D image of the sample and improving inspection of the sample. *McCord* does not teach that the inspection sensor (22a, 22b) comprises a camera. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a camera in the inspection sensor of *McCord* to take a high-resolution image of the sample wafer for inspection purposes. Additionally, it is well known in the art that inspection systems utilize camera devices, such as a CCD, for efficient and high precision sample imaging.

Regarding Claim 12, *McCord* teaches (column 13, lines 30-33) an inspection platform ("stage") for holding the wafer (12) while the wafer is inspected.

Regarding Claim 14, *McCord* teaches (column 1, lines 60-63; column 7, lines 38-42) an inspection device that may be an optical microscope (which typically include objectives) and

Regarding Claim 15, *McCord* teaches (Figure 2a) that said sensor (22a, 22b) and objective have a field of view (inherent) and further teaches (column 4, lines 40-46) that the focusing may be done prior to inspection, but does not teach how the field of views relate to each other. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use particular field of views in *McCord* to eliminate the need for focusing during inspection of the wafer in order to increase operation and cost efficiency. If the sensor has a better depth of field than the objective, then a slight change in the height detection would not necessarily require re-focusing of the objective.

Regarding Claim 16, *McCord* teaches (column 1, lines 60-63) that the inspection device may be an optical microscope (which typically includes plural objectives), but does not specifically teach a plurality of selectable objectives. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a plurality of selectable objectives in *McCord* to accommodate a wider range of field of views, thus enabling inspection of many different kinds of samples with different resolution requirements.

Regarding Claim 17, *McCord* teaches a height sensor (22a, 22b), but does not teach that the senor is a confocal sensor. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a confocal sensor in *McCord* to achieve a high resolution image by eliminating unwanted light that is not in the focal plane.

Regarding claim 19, *McCord* teaches (Figure 2a) an inspection sensor (column 1, lines 60-63; column 7 lines 38-42) but does not teach that the inspection sensor comprises a camera. It would have been obvious, however, to one of ordinary skill in the art at the time of the invention to use a camera in the inspection sensor of *McCord* to take a high-resolution image of

the sample wafer for inspection purposes. Additionally, it is well known in the art that inspection systems utilize camera devices, such as a CCD, for efficient and high precision sample imaging.

Claims 3, 9, 13, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCord in view of Watanabe et al. (U.S. 6,107,637).

Regarding claims 3 and 20, *McCord* teaches (Figure 2a) taking height data, but does not teach the specific data analysis means, such as interpolation. *Watanabe* teaches (column 45, lines 40-55) that the height data is used in an interpolation to calculate an exact height of each picture needed for the inspection of the sample (106) by the inspection device (100). (See also column 1, lines 20-26.) It would have been obvious to one of ordinary skill in the art at the time of the invention to use interpolation in *McCord*, as taught by *Watanabe*, to increase the precision of the height map.

Regarding claim 9, *McCord* teaches (Figure 2a) an auxiliary sensor for an inspection system, but does not teach a calibrator. *Watanabe* teaches (Figure 2) an inspection system comprising a height mapping auxiliary sensor (200) and a calibrator (109) for finding the offset between the auxiliary sensor (200) and an inspection lens (103). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a calibrator in *McCord*, as taught by *Watanabe*, to correct for any positional deviation that may occur between the two sensor systems.

Regarding Claim 13, *McCord* teaches (column 13, lines 30-50) that a wafer stage may be adjusted vertically relative to the inspection sensor, but does not teach alignment. *Watanabe* teaches (Figure 2) a wafer alignment device (107) coupled to the inspection platform (105) for

moving the inspection platform (105) relative to the camera (104, 122, 124). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a wafer alignment system in *McCord,* as taught by *Watanabe*, to ensure that the wafer is in the desired location (i.e. field of view) for the inspection device.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over McCord in view of view O'Dell et al. (U.S. 6,324,298).

Regarding claim 7, *McCord* teaches (Figure 2a; column 7, lines 38-42) an inspection device for wafer defects, but does not teach that the defect/feature is a gold or solder interconnect. *O'Dell* teaches (column 1, lines 12-26) an automated wafer defect inspection system wherein the detected features may be "bump or bond pad area defects such as gold or solder bump defects or similar interconnect defects." It would have been obvious to one of ordinary skill in the art at the time of the invention to detect defects interconnect features in *McCord*, as taught by *O'Dell*, to inspect a semiconductor device with plural components.

Response to Arguments

Applicant's arguments filed 2/21/06 regarding claims 1-21 have been fully considered but they are not persuasive. Applicant makes the following arguments:

A. *McCord* is not a proper 102(b) reference (response, page 8).

B. *McCord* does not teach obtaining height data at an offset from an optical field of view of a primary optical inspection device and an off-axis system is not inherently indicative of measuring at an offset from an optical field of view of a primary optical inspection device (response, page 9).

C. *McCord* does not teach generating a height map of a wafer surface prior to an inspection of the wafer surface (response, page 11).

Regarding Argument A, the Examiner agrees and notes that there was a typographical error in the previous office action: the rejection should have read "102(e)" and has been corrected herein. That being said, since the 102(e) rejection is still an anticipation rejection and applies the *McCord* reference in the same manner as the previous office action, it is not considered a new ground of rejection. Hence, this office action is made final.

Regarding Argument B, the Examiner does not find this persuasive. *McCord* teaches (column 3, lines 52-57) that an off-axis system refers to a "system in which the height measurement location is not the same as a sample location of the [inspection] system." (See also column 7, lines 38-42.) The sample location is the area of the wafer that is going to be imaged, and is thus the area within the field of view of the inspection system. Thus, if the height measurement location is "not the same as" the sample location, there is at least one area outside the field of view of the imaging system that is being used for the height sampling.

Regarding Argument C, the Examiner does not find this persuasive because although *McCord* teaches towards a preferred embodiment of concurrent height-mapping and inspection, it doesn't render the other embodiment of pre-inspection height-mapping unobvious. *McCord* teaches (column 4, lines 39-45) an inspection system that utilizes height-mapping prior to inspection of the wafer sample, the data of which is used to create focus map to be used during inspection of the wafer sample. *McCord* further teaches another embodiment utilizing concurrent height-mapping and wafer inspection, which arguably saves processing time. This does not, however, render the first embodiment inadequate or undesirable for all systems.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Davienne Monbleau whose telephone number is 571-272-1945. The examiner can normally be reached on Monday through Friday 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Darienne Monbleau

DNM

THANH X. LUU
PRIMARY EXAMINER